Radiation Safety Check-Off List for Operation of Booster with Ions from EBIS and Tandem

(for operation beginning 25 September 2014)

September 23, 2014

Prepared by: C.J. Gardner
Sign and Date: Chris J. Gardner 9/23/14
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Approved by: T. Roser
Sign and Date:
Ions from EBIS and Tandem may be injected and accelerated in Booster
only upon completion of this check-off list. Completion of this list
does not allow for the injection of protons from Linac.

Before proceeding with the numbered check-off items, the LTB, TTB, and ETB Beamstops must be Inserted, Locked, and Tagged. If necessary, equivalent devices and/or procedures may be substituted with appropriate LP and RSC approval. The Beamstop Locks and Tags are as follows:

1. CJ6 (LPB) LOTO Linac-To-Booster (LTB) Beamstop Enable Key (in Building 914):

Tag Number 5317 (placed on LTB DH2-5 PS breaker)

Lock Number 15L994

Person/Date: Chris Gardner 26 August 2014

2. <u>CJG</u> (LPB) LOTO Tandem-To-Booster (TTB) Beamstop Enable Key (in Building 914):

Tag Number 5343

Lock Number 10L222

Person/Date: Chris Gardner 29 August 2014

3. (LPB) LOTO EBIS-To-Booster (ETB) Beamstop Enable Key (in Building 914):

Tag Number 5342 (placed on Booster MMPS key switch)

Lock Number 10L255

Person/Date: Chris Gardner 26 August 2014

Note: The Lock and Tag prohibiting proton injection from Linac may not be removed until a radiation safety checkoff list for operation of Booster with protons from Linac is completed.

The following items are to be initialed as complete:

1 Security System

1. (ACG) Functional Test of the Booster access control system complete.

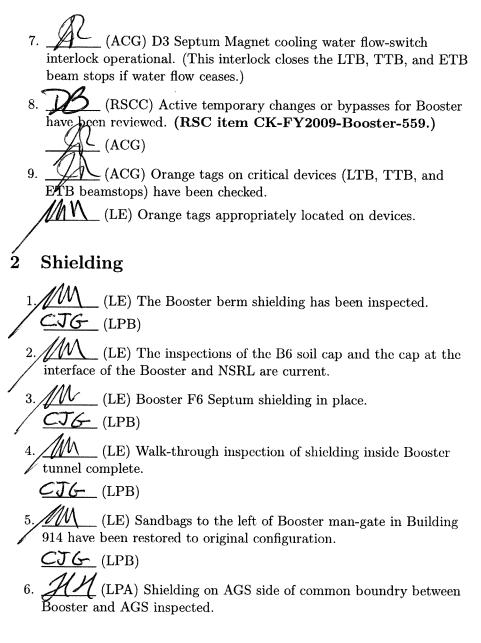
2. (ACG) Functional Test of Booster Extraction interlocks

3. (ACG) Functional Test of Booster-NSRL Penetration Stub interlocks complete. (These interlocks ensure that the stub region cannot be entered with beam in Booster.)

4. (ACG) Functional Test of HEBT-TTB Cross-Over interlocks complete. (These interlocks ensure that this region cannot be entered with the TTB beamstops open.)

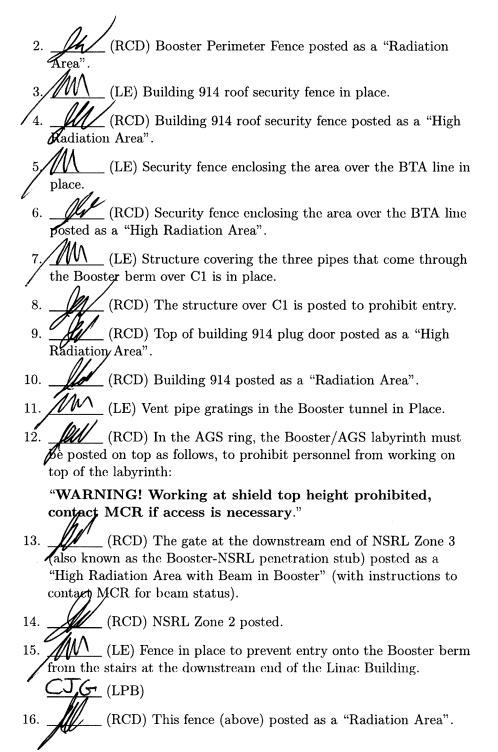
5. (ACG) Booster Shutter to prevent long stored beam installed and operational. (The shutter is located in the B6 straight section downstream of the dump.)

6. (ACG) B6 Dump cooling water flow-switch interlock operational. (This interlock closes the LTB, TTB, and ETB beam stops if water flow ceases.)



3 Fencing and Posting

1. (LE) Booster Perimeter Fence in place.



4 Chipmunks

- 1. (ACIG) Chipmunk NM060 on top of Building 914 plug door installed and checkout complete. This chipmunk is set to alarm at 40 and interlock at 50 mr/hour.
- 2. ACIG) Chipmunk NM058 in "High Radiation Area" on Booster berm over F6 Septum installed and checkout complete. This chipmunk is set to alarm at 40 and interlock at 50 mr/hour.
- 3. ACIG) Chipmunk NM059 in "High Radiation Area" on Booster berm over BTA DH2 & 3 installed and checkout complete. This chipmunk is set to alarm at 40 and interlock at 50 mr/hour.
- 4. _______ (ACIG) Chipmunks NM133 and NM134 in the Booster-NSRL Penetration Stub are installed and checkout complete. The chipmunk at the penetration headwall (NM134) is set to alarm at 16 and interlock at 20 mr/hour. The chipmunk at the stub gate (NM133) is set to alarm at 1 and interlock at 20 mr/hour. (Note that these chipmunks are disabled when extraction from Booster to NSRL is permitted.)
- 5. (ACIG) Chipmunk NM112 on Linac side of EBIS-Booster Penetration installed and checkout complete. This Chipmunk is located at beam height at the penetration headwall close to where the beam pipe enters the wall. It is set to alarm at 2.0 and interlock at 2.5 mr/hour.
- 6. (ACIG) All chipmunks are within their allowed calibration periods.
- 7. (LPB) Location of above chipmunks checked.

5 Booster Extraction to AGS

1. CTG (LPB) Red Radiation Security Hold Tags have been applied to BTA QV5 power supply and magnet to ensure that the polarity of this quadrupole is not changed. (The quadrupole is wired to be vertically focusing for particles with positive charge).

Either Item 2 OR Item 3 must be completed:

2. _____ (LPA) The AGS is ready to accept beam.

OR

3. $\underbrace{\mathcal{H}}_{\text{Tag No.}}$ (LPA) Booster Extraction to AGS is LOTO:

Lock No. 32691/10L723

Person/Date: Haixin Huang 9/23/2014

6 Booster Extraction to NSRL

Either Item 1 OR Item 2 must be completed:

1. CPRARSM FOR A RUSER.
(LPN) NSRL (R-line) is ready to accept beam.

2. **ZB** (LPN) Booster Extraction to NSRL is LOTO:

Tag No. <u>7456</u>/ 7457

Lock No. 3452/3656

Person/Date: ADAM RUSEK 9/23/14

12.4.2014: Tags: 7458/7459

on: stubtunnel / D6 beam plug / Power supply

- Adam Rusek

7 Sweeps

1. <u>IB</u> (MCR) Area over BTA swept and locked.

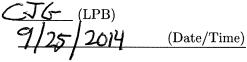
2. _____ (MCR) Booster Berm swept and locked.

3. ______ (MCR) Booster swept and locked.

8 Verification and Permission

All of the above check-off items have been initialed as complete.

The RS LOTO(s) that prevent EBIS and Tandem Ion beams from entering Booster may be removed. The **ETB** and **TTB** beamstop remote enable keys (in Bldg. 914) may be inserted and turned (or equivalent devices enabled) to allow beam enable from the MCR.



Abbreviations

LPA = Liaison Physicist AGS (Haixin Huang or designee)

LPB = Liaison Physicist Booster (Chris Gardner or designee)

LPN = Liaison Physicist NSRL (Adam Rusek or designee) -> JAN BLACKER

LE = Liaison Engineer (George Mahler or designee)

CME = Chief Mechanical Engineer, ME (Joe Tuozzolo or designee)

RSC = Radiation Safety Committee (Dana Beavis or designee)

RSCC = Radiation Safety Committee Chairman (Dana Beavis)

ACG = Access Control Group (Jonathan Reich or designee)

RCD = Radiation Control Division (Paul Bergh or designce)

ACIG = Accelerator Components and Instrumentation Group

(Tony Curcio or designee)

MCR = Main Control Room

OC = Operations Coordinator